

SPEAKER BACK CAVITY

BACKGROUND

[0001] 1. Technical Field

[0002] The exemplary and non-limiting embodiments relate generally to a sound transducer and, more particularly, to a back cavity for a sound transducer.

[0003] 2. Brief Description of Prior Developments

[0004] A speaker in a portable electronic device, such as a mobile phone for example, often has a back cavity for acoustic purposes.

SUMMARY

[0005] The following summary is merely intended to be exemplary. The summary is not intended to limit the scope of the claims.

[0006] In accordance with one aspect, an example embodiment is provided in an apparatus including a sound transducer; and a housing having the sound transducer connected thereto. The housing forms a substantially sealed air space back cavity acoustically coupled to the sound transducer. The housing includes a housing member having a first dividing structure located in the back cavity to connect two adjacent air mass sections of the back cavity, where the dividing structure includes at least one aperture to permit travel of sound waves through the at least one aperture between the air mass sections.

[0007] In accordance with another aspect, an example method comprises providing a sound transducer; connecting a housing member to the sound transducer, where the housing member comprises a wall establishing a perimeter of a back cavity area for the sound transducer, where the wall forms the back cavity area on a single first side of the housing member, where the housing member comprises a first dividing structure located in the back cavity area connecting two adjacent air mass sections of the back cavity area; and connecting the first side of the housing member to at least one second member to substantially close the back cavity area, where the wall and the first dividing structure attach to the at least one second member to form a substantially sealed air space back cavity acoustically coupled to the sound transducer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The foregoing aspects and other features are explained in the following description, taken in connection with the accompanying drawings, wherein;

[0009] FIG. 1 is a front view of an example embodiment of an apparatus comprising features as described herein;

[0010] FIG. 2 is a rear view of the apparatus shown in FIG. 1;

[0011] FIG. 3 is an exploded perspective view of components of the speaker and its housing member shown in FIG. 2;

[0012] FIG. 4 is a perspective view of an alternate embodiment of one of the components shown in FIG. 3;

[0013] FIG. 5 is a perspective view of other possible components of the apparatus shown in FIGS. 1-3;

[0014] FIG. 6 is a bottom plan view of the housing member shown in FIG. 3;

[0015] FIG. 6A is a schematic cross section view of the speaker and housing member shown in FIGS. 3 and 6 attached to a printed circuit board of the apparatus shown in FIGS. 1-2;

[0016] FIG. 7 is a bottom plan view of the housing member shown in FIG. 6, but without the dividing structures;

[0017] FIG. 8 is a graph of speaker frequency response at 1 Volt for use with the housing member shown in FIG. 6 versus the housing member shown in FIG. 7;

[0018] FIG. 9 is a graph of simulated speaker frequency response at 700 mV for use with the housing member shown in FIG. 6 versus a housing member similar to that shown in FIG. 6 but having only one dividing structure rather than two dividing structures;

[0019] FIG. 10 is an enlarged view of a portion of the graph shown in FIG. 9;

[0020] FIG. 11 is a view as in FIG. 10 of simulated speaker frequency response at 700 mV with use of the housing member shown in FIG. 7 versus a housing member as in FIG. 6 but having only one dividing structure;

[0021] FIG. 12 is a graph illustrating design limits for a speaker and sample speaker frequency responses for a speaker using the housing member shown in FIG. 7; and

[0022] FIG. 13 is a graph similar to FIG. 12 illustrating the design limits and sample speaker frequency responses for a speaker using the housing member shown in FIG. 6.

DETAILED DESCRIPTION OF EMBODIMENTS

[0023] Referring to FIG. 1, there is shown a front view of an apparatus 10 incorporating features of an example embodiment. Although the features will be described with reference to the example embodiments shown in the drawings, it should be understood that features can be embodied in many alternate forms of embodiments. In addition, any suitable size, shape or type of elements or materials could be used.

[0024] The apparatus 10 may be a hand-held portable apparatus, such as a communications device which includes a telephone application for example. In the example shown the apparatus 10 is a smartphone which includes a camera and a camera application. The apparatus 10 may additionally or alternatively comprise an Internet browser application, a video recorder application, a music player and recorder application, an email application, a navigation application, a gaming application, and/or any other suitable electronic device application. In an alternate example embodiment the apparatus might not be a smartphone.

[0025] Referring also to FIG. 2, the apparatus 10, in this example embodiment, comprises a housing 12, a touchscreen 14, a receiver 16, a transmitter 18, a controller 20, a rechargeable battery 26 and a camera 30. However, all of these features are not necessary to implement the features described below. The controller 20 may include at least one processor 22, at least one memory 24, and software 28. The electronic circuitry inside the housing 12 may comprise at least one printed wiring board (PWB) 21 having components such as the controller 20 thereon. The receiver 16 and transmitter 18 form a primary communications system to allow the apparatus 10 to communicate with a wireless telephone system, such as a mobile telephone base station for example.

[0026] In this example, the apparatus 10 includes the camera 30 which is located at the rear side 13 of the apparatus, a front camera 32, an LED 34, and a flash system 36. The LED 34 and the flash system 36 are also visible at the rear side of the apparatus, and are provided for the camera 30. The cameras 30, 32, the LED 34 and the flash system 36 are connected to the controller 20 such that the controller 20 may control their operation. In an alternate example embodiment the rear side may comprise more than one camera, and/or the front side could comprise more than one camera. The apparatus 10 includes a sound transducer provided as a microphone 38. In